

SCALPELLOID BARNACLES FROM THE UPPER CRETACEOUS OF SOUTHEASTERN NORTH CAROLINA

Victor A. Zullo and Norman F. Sohl

Abstract. — *Zeugmatolepas* sp. and *Virgiscalpellum inornatum*, new species, occur in the Upper Cretaceous (Campanian) Black Creek Formation at Donoho Creek Landing, Cape Fear River, North Carolina. These are the first barnacles to be described from the Cretaceous of the Atlantic Coastal Plain.

Capitular plates of two scalpelloid barnacles were collected from a medium- to coarse-grained sand near the top of the Upper Cretaceous (Campanian) Black Creek Formation at Donoho Creek Landing on the Cape Fear River in Bladen County, North Carolina (Fig. 1). One series of small plates, tentatively identified as carinae, rostra and lower latera, is from an undetermined species of *Zeugmatolepas* Withers. The only previous North American record of *Zeugmatolepas* is that of Hattin (1982) from the Smoky Hill Chalk Member of the Niobrara Formation in western Kansas. Otherwise, *Zeugmatolepas* is known from Europe, the South Georgia Islands, western South America and western Australia.

The larger and more abundant plates from Donoho Landing include carinae, scuta and terga of a new species of *Virgiscalpellum* Withers. This new species is similar to *V. gabbi* (Pilsbry) from the Ripley and Prairie Bluff Formations of Tennessee, Mississippi and Alabama, but is readily distinguished on ornamentation, location of umbones, and shape of plates. *Virgiscalpellum* is known only from Cretaceous rocks in western Europe and the Americas.

Although Cretaceous barnacles have long been known from the Western Interior and Gulf Coast regions of North America (see Collins 1973; Hattin 1977), the Black Creek specimens constitute the first Cretaceous barnacle records for the Atlantic Coastal Plain.

Stratigraphic Setting

The barnacles were obtained during an investigation of the Black Creek-Peedee formational contact along the Cape Fear River (Sohl and Christopher 1983). The Black Creek Formation of Campanian age (*Exogyra ponderosa* Zone) is overlain disconformably by the Peedee Formation of Maestrichtian age (*E. costata* Zone). At Donoho Creek Landing (Fig. 2), units 1 through 4 represent the Black Creek Formation and contain *E. ponderosa erraticostata* (Stephenson), *E. costata spinosa* Stephenson and *Flemingostrea pratti* (Stephenson), indicating assignment to the uppermost part of the *E. ponderosa* Zone. Barnacle plates are abundant in unit 2 (USGS localities 31796, 31868), and are associated with a nearshore, marine megafossil assemblage of epifaunal suspension feeders.

Locality description. — U.S. Geological Survey (Mesozoic Invertebrate Collection) localities 31796, 31868. Black Creek Formation, unit 2, Donoho Creek Landing, milepost 50.25 on west bank of Cape Fear River, Bladen County, North

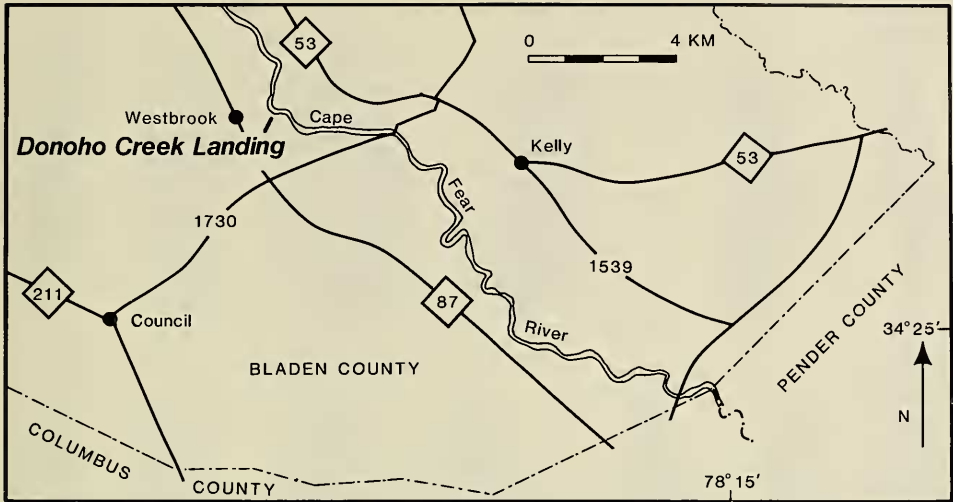


Fig. 1. Location of Donoho Creek Landing on the Cape Fear River, North Carolina.

Carolina 34°28'26"N, 78°24'40"W. Medium- to coarse-grained, subrounded to subangular, poorly sorted, fossiliferous sand. N. F. Sohl, collector.

Systematic Paleontology

- Subclass Cirripedia Burmeister, 1834
- Order Thoracica Darwin, 1854
- Suborder Lepadomorpha Pilsbry, 1916
- Superfamily Scalpelloidea (Pilsbry) Zevina, 1980
- Family Scalpellidae Pilsbry, 1916
- Subfamily Calanticinae Zevina, 1978
- Genus *Zeugmatolepas* Withers, 1913
- Zeugmatolepas* species indet.

Figs. 3a–m

Material. — Nine carinae, 15 rostra and 2 lower latera, USGS locs. 31796, 31868.

Disposition of specimens. — Hypotypes USNM 382778 through 382783 and hypotype lots 382784 and 382785 are deposited in the Division of Paleobiology, U.S. National Museum of Natural History, Washington, D.C.

Discussion. — A group of plates, ranging in size from 3.0 to 6.5 mm, appear to be from the lower whorls of a species of *Zeugmatolepas*. This genus is known to range from the Jurassic (Callovian) through the Paleocene (Danian), and is best known from numerous species in western Europe (Withers 1928, 1935, 1947). The Donoho Creek Landing specimens, although well-preserved, are difficult to relate to specific plate types and, in the absence of species-diagnostic terga and scuta, are insufficient for species recognition.

The carinae (Figs. 3a–b, f–g) range in size from 4.0 to 5.5 mm in height, are thick, and extremely narrow (five times higher than wide). These plates bear some resemblance to carinae of the European Campanian species *Z. cretae* (Steenstrup)

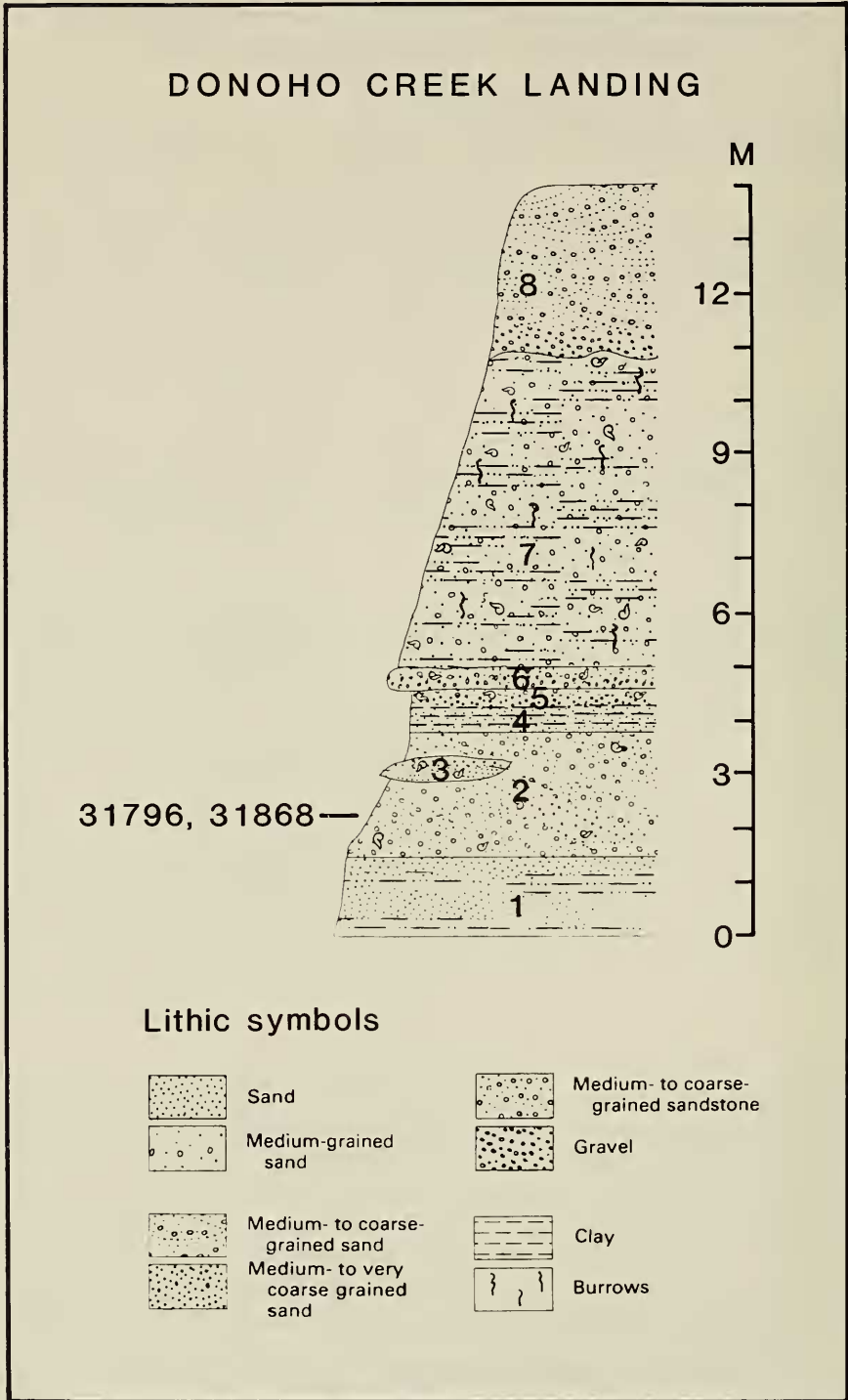


Fig. 2. Stratigraphic section of the column exposed at Donoho Creek Landing, showing barnacle localities in unit 2. Contact of Black Creek Formation with overlying Peedee Formation is at base of unit 5. Section modified from Sohl and Christopher (1983).

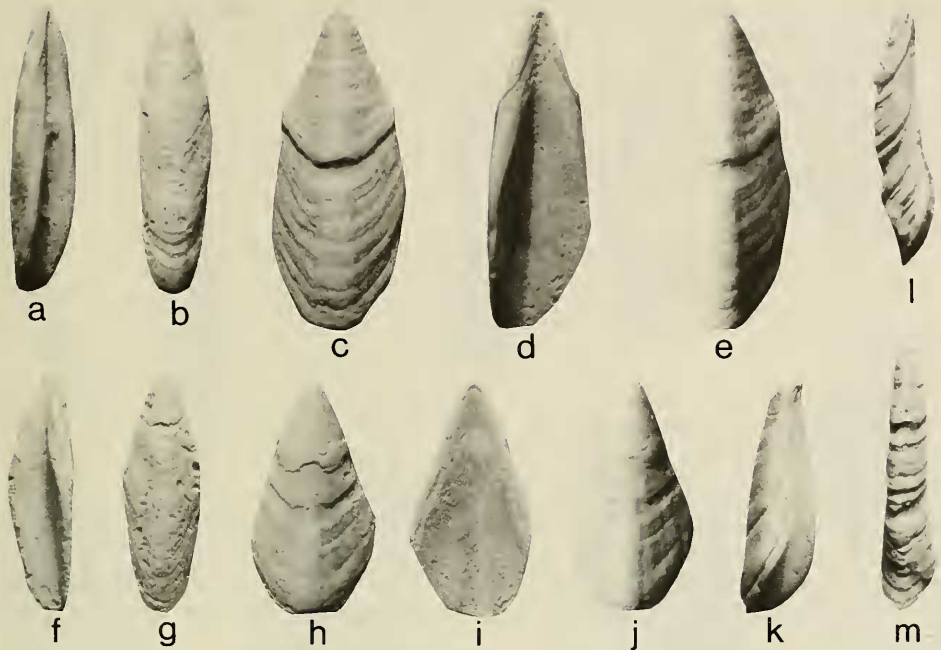


Fig. 3. *Zeugmatolepas* species: a–b, Oblique interior and exterior views of carina, hypotype USNM 382778; c–d, Exterior and oblique interior views of rostrum, hypotype USNM 382779; e, Rostrum of Fig. 3c overexposed to show fine radial striae; f–g, Oblique interior and exterior views of carina, hypotype USNM 382780; h–i, Exterior and interior views of rostrum, hypotype USNM 382781; j, Rostrum of Fig. 3h overexposed to show fine radial striae; k, Oblique side view of lower latus, hypotype USNM 382782; l–m, Side and exterior views of lower latus, hypotype USNM 382783. All illustrations $\times 7$.

figured by Withers (1935, pl. 3, fig. 15, pl. 4, fig. 1). The tectum is narrow and in lateral view is nearly straight except for the apical part which is curved inwardly. The plate in cross-section is acutely V-shaped, with no apparent differentiation between tectum and parietes. In tectal view the carina is widest at or below the midline. The apex is acute and the basal margin is narrowly rounded. The lateral edges of the plate are thickened, especially in the upper half, but the inner surface is open from base to apex. A few specimens bear faint, oblique growth lines on the inner surface near the apex.

The rostra (Figs. 3c–e, h–j) are considerably thinner and broader than the carinae, and range in size between 3.0 and 6.0 mm in height. These rostra are remarkably similar to those of the European Cenomanian species *Z. mockleri* Withers (Withers 1935, pl. 2, figs. 9a–b). The rostra are sub-diamond-shaped, broadly V-shaped in cross-section, and bear a low, rounded, apico-basal ridge that broadens basally. In lateral view the plates are nearly straight to slightly convex. The apex is acute and the basal margin is truncate or narrowly rounded. The outer surface is ornamented by prominent growth ridges cut by fine, longitudinal striae on either side of the apico-basal ridge (Figs. 3e, j). The edges of the plate are slightly thickened, the inner surface is broadly concave, and the inner apical region bears oblique growth lines.

Two plates (Figs. 3k–m) appear to represent lower latera, particularly the type

depicted for the European Lower Cretaceous species *Z. (?) hausmanni* (Koch and Dunker) by Withers (1935, pl. 3, figs. 5t–u). These plates are 4.0 to 5.0 mm in height, very narrow, are infilled in their upper halves, and are ornamented by prominent, imbricating growth ridges.

It is likely that the Black Creek *Zeugmatolepas* is a new species, but in the absence of upper whorl plates, specific identification is not warranted.

Subfamily Arcoscalpellinae Zevina, 1978

Genus *Virgiscalpellum* Withers, 1935

Virgiscalpellum inornatum, new species

Figs. 4a–n

Holotype.—Carina, U.S. National Museum no. 382786.

Type-locality.—Upper Cretaceous, Black Creek Formation, Donoho Creek Landing, Bladen County, North Carolina, USGS loc. 31796.

Diagnosis.—Carina narrow, angular, with prominent umbo removed from apex and located on upper two-fifths of plate; surface of plate without radial ornament. Umbo of scutum markedly subcentral, one-third distance from rostral angle; surface ornamented by prominent growth ridges crossed by fine striae radiating from umbo. Tergum narrow, slightly curved towards carinae, with low, rounded, apico-basal ridge.

Description.—Carina (Figs. 4a–e) narrow in tectal view, thin in lateral view, obtusely angulate (130° – 140°); largest specimen 8.0 mm in length; position of prominent umbo variable, but always below apex and never more than a distance equal to two-fifths length of plate; narrow, arched tectum not differentiated from broad, parallel-sided or moderately divergent parietes; parietes separated from moderately divergent intraparietes by obscure, low ridge; carina in tectal view broadest in lower half, with breadth of plate increasing between umbo and acutely rounded basal margin; carina narrowest near middle (waist), becoming slightly broader with nearly parallel sides to acutely rounded apex; interior of plate never infilled, broadly open between apex and base, except at waist; exterior surface without ridges or striae radiating from umbo, and ornamented solely by prominent growth ridges.

Scutum (Figs. 4f–k) up to 10.0 mm in height, twice as high as wide, subrectangular, moderately thick, with markedly subcentral umbo located on the occludent margin one-third the distance from the rostral angle; occludent margin straight to slightly concave above umbo, strongly convex below umbo to the acutely rounded rostral angle; a deep, narrow furrow, sometimes bordered inwardly by a low ridge, extends from the umbo to a point on the tergal margin one-quarter the distance from the acutely angulate apex to the broadly rounded basitergal angle; the intersection of the furrow with the tergal margin is marked by a sharp projection above the otherwise straight to slightly convex tergal margin; the basicarinal margin is straight to slightly convex and about equal in length to the tergal margin; exterior surface ornamented by prominent growth ridges and in the upper half of the plates, by fine, obscure, and irregularly-spaced striae radiating from the umbo; the interior of the scutum bears a large, deep, adductor muscle pit bordered on its upper, occludent margin by a prominent, straight ridge; the oc-

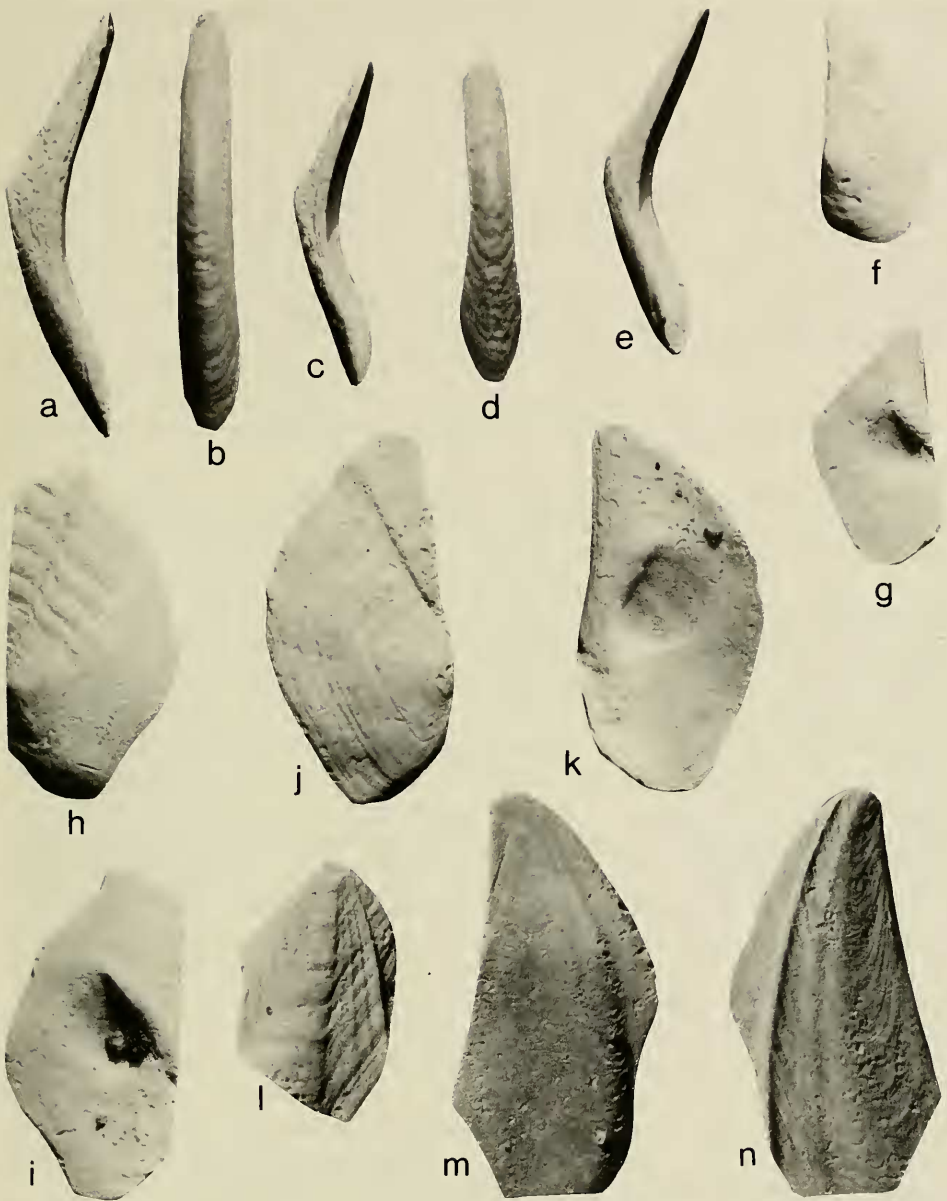


Fig. 4. *Virgiscalpellum inornatum*: a-b, Side and tectal views of carina, holotype USNM 382786; c-d, Oblique side and tectal views of carina, paratype USNM 382787; e, Oblique side view of carina, paratype USNM 382788; f-g, Exterior and interior views of scutum, paratype USNM 382789; h-i, Exterior and interior views of scutum, paratype USNM 382790; j-k, Exterior and interior views of scutum, paratype USNM 382791; l, Exterior of broken tergum showing radial threads, paratype USNM 382792; m-n, Interior and exterior views of broken tergum, paratype USNM 382793. All illustrations $\times 7$.

cludent border often bears a small, shallow pit (for males?) immediately below the umbo.

Tergum (Figs. 4l–n) relatively thin, narrow, about 3 times higher than wide, the largest specimen (broken) 7.8 mm in height; apico-basal ridge broad, low, rounded; ocludent margin broadly convex; carinal margin slightly concave; apex worn in all specimens, but probably acute; basal angle, based on growth lines, narrowly rounded; a narrow, sharp ridge extends from the apex to the scutal margin halfway between the apico-basal ridge and the ocludent margin; 1 or 2 fine longitudinal threads may be present between the 2 main ridges.

Material.—Nine complete and 18 fragmentary carinae; 11 complete and 8 fragmentary scuta; 5 partial terga from USGS loc. 31796.

Disposition of types.—Holotype USNM 382786, paratypes USNM 382787 through 382793, and paratype lots USNM 382794 through 382796 are in the Division of Paleobiology, U.S. National Museum of Natural History, Washington, D.C.

Etymology.—The specific name *inornatum* is from the Latin *inornatus*, meaning unadorned, and refers to the absence of external radial ornament on the carina.

Discussion.—*Virgiscalpellum inornatum* most closely resembles *V. gabbi* (Pilsbry, 1933) from the Ripley and Prairie Bluff Formations in Tennessee, Mississippi and Alabama and particularly, *V. gabbi gabbi* as described by Collins (1973). The new species is distinguished by its carina which lacks external radial ornament and has its greatest breadth in the lower rather than the upper half of the plate; by its scutum whose umbo is well below the center of the ocludent margin and whose shape is more rectangular than triangular; and by its tergum that is somewhat broader, less curved towards the carina, and bears a better developed apico-basal ridge. The tergum of *V. inornatum* approaches that of *Virgiscalpellum* sp. figured by Collins (1973, pl. 5, fig. 13) from the upper Ripley Formation in Mississippi, in breadth and in development of an apico-basal ridge, but differs in having a concave carinal margin and a more attenuated apical half. *Virgiscalpellum inornatum* is most readily distinguished from European species of *Virgiscalpellum* and from *V. paitense* (Pilsbry and Olsson, 1951) from the Upper Cretaceous Tortuga Formation of Peru by the absence of radial ornament on the carina and the subdued nature of the ornament on the scuta and terga. *Virgiscalpellum heteroplax* (Pilsbry and Olsson, 1951) and *V. euglyptum* (Pilsbry and Olsson, 1951), also from the Tortuga Formation, are known only from scuta. The shape of the scutum of *V. inornatum* differs markedly from that of *V. heteroplax*, and the position of the scutal umbo in *V. inornatum* is considerably lower on the ocludent margin than the centrally-placed umbo of *V. euglyptum*.

The absence of radial ornament on carinae of *V. inornatum* is not the result of abrasion during transport and deposition. Such abrasion is present on the edges of the plates, but the preservation of growth ridges and umbones on several carinae clearly indicates that wear did not alter external ornamentation significantly. The plates of both *V. inornatum* and *Zeugmatolepas* sp. show signs of sorting. In the case of the former species, none of the plates is more than half the size of the larger plates of *V. gabbi* figured by Collins (1973), suggesting that the Black Creek examples are from young adults. Similarly, none of the larger, upper whorl plates where found for the Black Creek *Zeugmatolepas*.

The genus *Virgiscalpellum* ranges from the Aptian (Withers 1947, 1953) through

the Maestrichtian (Withers 1935), with the greatest known species diversity being in Maestrichtian time. In North America *Virgiscalpellum* is now known from the upper Campanian and the Maestrichtian.

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(VAZ) Department of Earth Sciences, University of North Carolina at Wilmington, Wilmington, North Carolina 28403; (NFS) United States Geological Survey, Washington, D.C. 20560.